SPACE STATION ASSEMBLY/SERVICING CAPABILITIES

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SUMMARY

THE AIM OF THE SPACE STATION IS TO PLACE A PERMANENTLY MANNED SPACE STATION ON-ORBIT AROUND THE EARTH. IT RESPONDS TO PRESIDENT REAGAN'S DIRECTIVE STATED IN HIS STATE OF THE UNION MESSAGE ON JANUARY 25, 1986. THIS TALK FOCUSES ON THE CORE SPACE STATION. THE OTHER SPACE STATION PROGRAM ELEMENTS INCLUDE THE CO-ORBITING AND POLAR PLATFORMS.

THE SPACE STATION PROGRAM IS INTERNATIONAL IN SCOPE. CANADA, EUROPE, AND JAPAN ARE OUR PARTNERS. NOTE THE CANADIAN MOBILE SERVICING CENTRE SYSTEM WHICH SHOULD PLAY A ROLE IN PAYLOAD SERVICING.

THE PROGRAM IS NEARING THE CLOSE OF THE SYSTEM DEFINITION AND PRELIMINARY DESIGN PHASE. THE FINAL DESIGN AND DEVELOPMENT PHASE WILL BEGIN IN THE FIRST HALF OF 1987. THE FIRST SHUTTLE LAUNCH FOR SPACE STATION ASSEMBLY ON-ORBIT IS ESTIMATED FOR JANUARY 1993. THE BASELINE ASSEMBLY SEQUENCE IS SHOWN AND THE INITIAL OPERATING CAPABILITY FOR THE MANNED CORE STATION IS DESCRIBED.

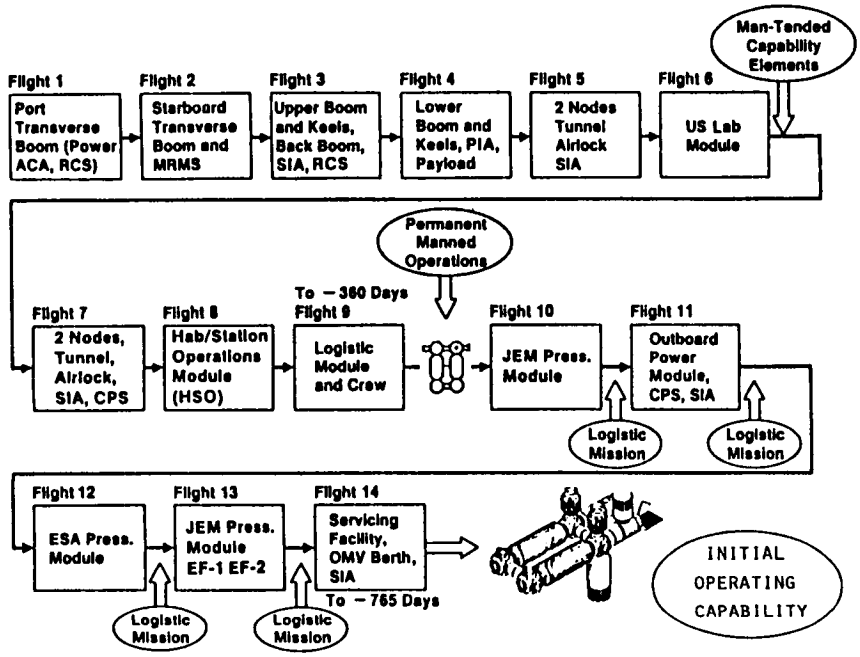
TOPICS PERCEIVED TO BE IMPORTANT TO ON-ORBIT ASSEMBLY AND SERVICING ARE DISCUSSED. EXTRAVEHICULAR ACTIVITY (EVA) PERMITS HANDS-ON OPERATIONS BY CREW MEMBERS IN ALL UNPRESSURIZED AREAS OF THE SPACE STATION. EVA IS A LIMITED RESOURCE THAT HAS TO BE ALLOCATED FOR BEST RETURN. THE CUSTOMER SERVICING FACILITY PROVIDES PROTECTION AND MANIPULATION OF PAYLOADS. IT FACILITATES THE SERVICING OF PAYLOADS AND SATELLITES. THE CANADIAN MOBILE SERVICING CENTRE SYSTEM WILL BE A ROBUST TELEROBOTIC SERVICER OPERATING IN THE SPACE ENVIRONMENT. IT SHOULD BE CAPABLE OF ACCESSING THE SHUTTLE CARGO BAY TO RETRIEVE CARGO, AND TRANSPORTING CARGO TO THE APPROPRIATE SITE OF OPERATION. A FLIGHT TELEROBOTICS CAPABILITY WITH DEXTROUS MANIPULATOR ARMS IS PLANNED FOR DEVELOPMENT BY THE UNITED STATES.

THE AUTHOR, JOSEPH P. JOYCE, IS A MEMBER OF THE POWER SYSTEM INTEGRATION OFFICE WITHIN THE LEWIS RESEARCH CENTER SPACE STATION SYSTEMS DIRECTORATE. HE IS PROJECT MANAGER FOR SYSTEM REQUIREMENTS AND INTERFACES IN THE AREAS OF OPERATIONS. ALSO HE IS A MEMBER OF THE SPACE STATION OPERATIONS PANEL AND A MEMBER OF OPERATIONS ASSOCIATED INTEGRATED CONFIGURATION AND ANALYSIS PANELS.

LAUNCH SCHEDULE

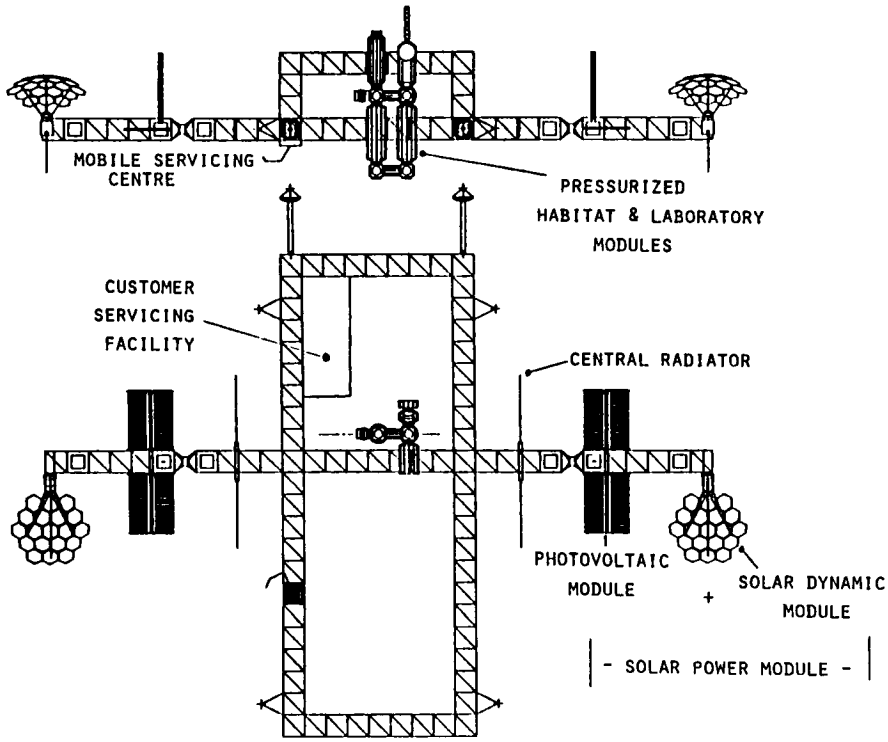
CORE SPACE STATION ASSEMBLY SEQUENCE

(MARCH 1986)



INITIAL OPERATING CAPABILITY

— CORE SPACE STATION —



ELECTRICAL POWER SYSTEM (EPS)

-- LEWIS RESEARCH CENTER RESPONSIBILITY --

SCOPE:

THE EPS INCLUDES POWER GENERATION, ENERGY STORAGE, POWER CONDITIONING, POWER SYSTEM CONTROL, POWER TRANSMISSION, POWER DISTRIBUTION, AND POWER MANAGEMENT. THE EPS COMPONENTS FOR GENERATION, STORAGE, CONDITIONING AND CONTROL ARE LOCATED IN THE SOLAR POWER MODULE FLIGHT ELEMENT.

DESCRIPTION:

SYSTEM	-	SOLAR DYNAMIC/PHOTOVOLTAIC HYBRID (STATION)
	-	PHOTOVOLTAIC (PLATFORMS)
PV ARRAY	-	SILICON, FLEXIBLE/DEPLOYABLE/RETRACTABLE DUAL
	-	BLANKET (COMMON STATION/PLATFORMS)
ENERGY STORAGE	-	NI/H_2 BATTERIES (PV)
	-	THERMAL
THERMAL	-	DEDICATED RADIATORS
DISTRIBUTION	-	20KHZ AC AT 208V

TOPICS RELATIVE TO ASSEMBLY AND SERVICING

- EXTRAVEHICULAR ACTIVITY
- CUSTOMER SERVICING FACILITY
- MOBILE SERVICING CENTRE SYSTEM
- ROBOTICS

EXTRAVEHICULAR ACTIVITY

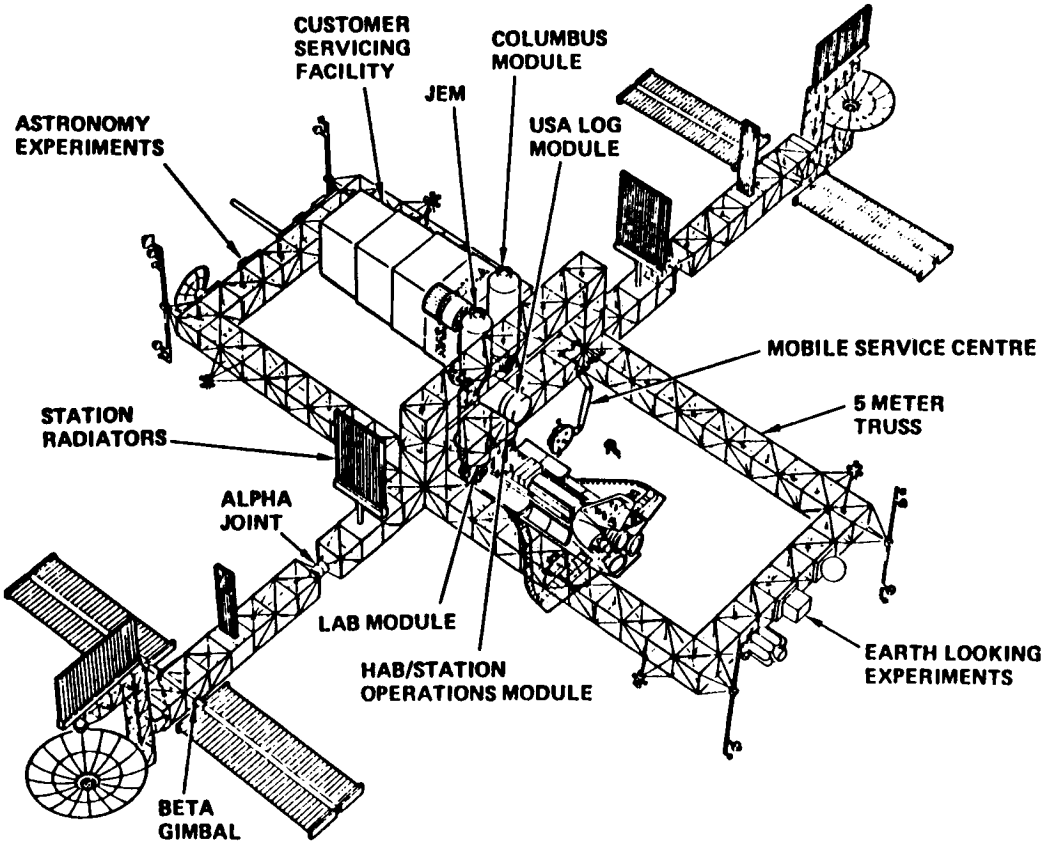
MAKEUP - LIFE SUPPORT (SPACE SUIT)
- AIR LOCK
- TRANSFER AIRLOCK
- TRANSLATION AIDS
- EQUIPMENT LIGHTING

USE - ASSEMBLY
- MAINTENANCE
- SERVICING
- REPAIR

COMPATIBILITY - MOBILE SERVICING CENTRE SYSTEM
- CUSTOMER SERVICING FACILITY

RESOURCE - LIMITED
- TWO CREWPERSONS PER EVA
- 640 TOTAL EVA HOURS PER YEAR, STS SUIT
  (1872 TOTAL EVA HOURS PER YEAR, HIGH PRESSURE SUIT)

OPERATIONAL CORE SPACE STATION



CUSTOMER SERVICING FACILITY

-- GODDARD SPACE FLIGHT CENTER RESPONSIBLITY --

DEFINITION:

AN UNPRESSURIZED WORK SPACE FOR SERVICING AND ASSEMBLY OF FREE-FLYERS, ATTACHED PAYLOADS, PLATFORMS, AND OTHER CUSTOMER PAYLOADS.

PROVIDES:

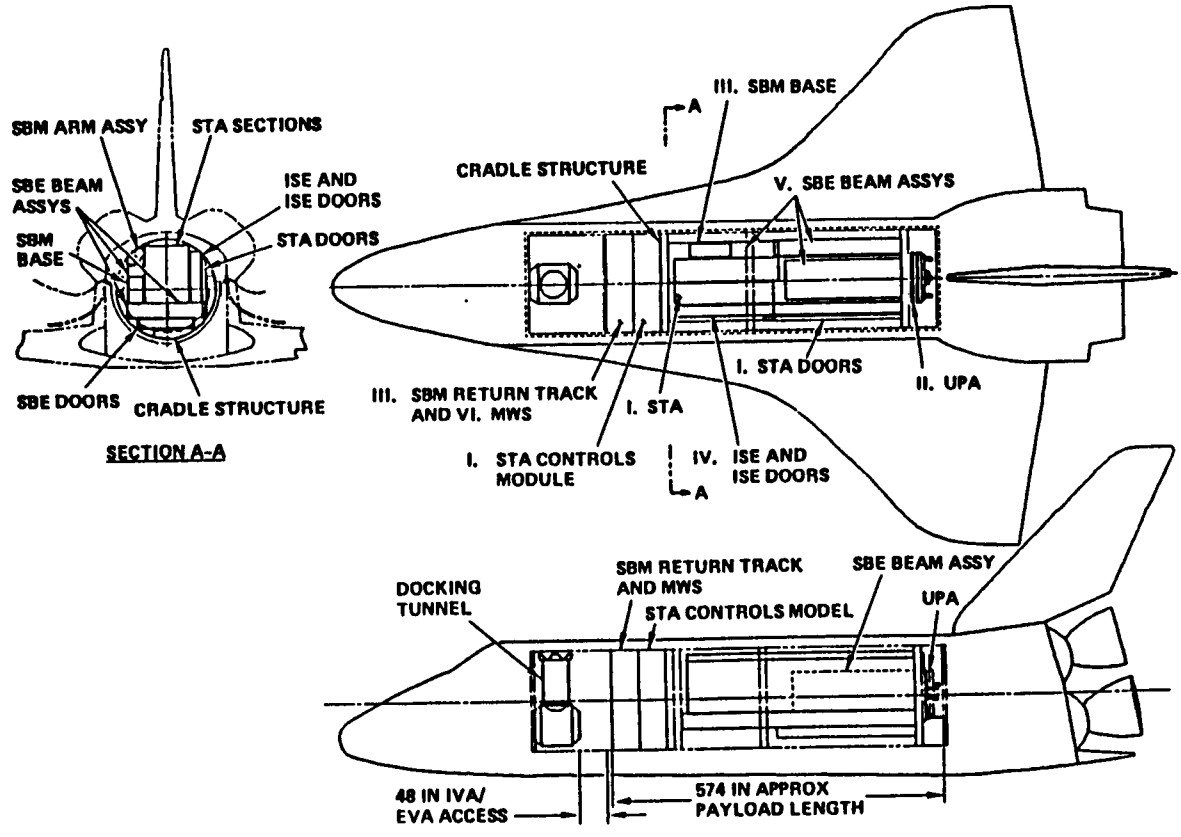
- PROTECTION
- MANIPULATION
- STORAGE OF TOOLS AND ORBITAL REPLACEMENT UNITS
- TEST AFTER SERVICE
- ACCOMODATION FOR EVA

FACILITATES:

- REPLACEMENT OF INSTRUMENTS
- REPLACEMENT OF CONSUMABLES
- CHANGE OUT OF ORU'S AND PAYLOADS
- ASSEMBLY OF PAYLOADS

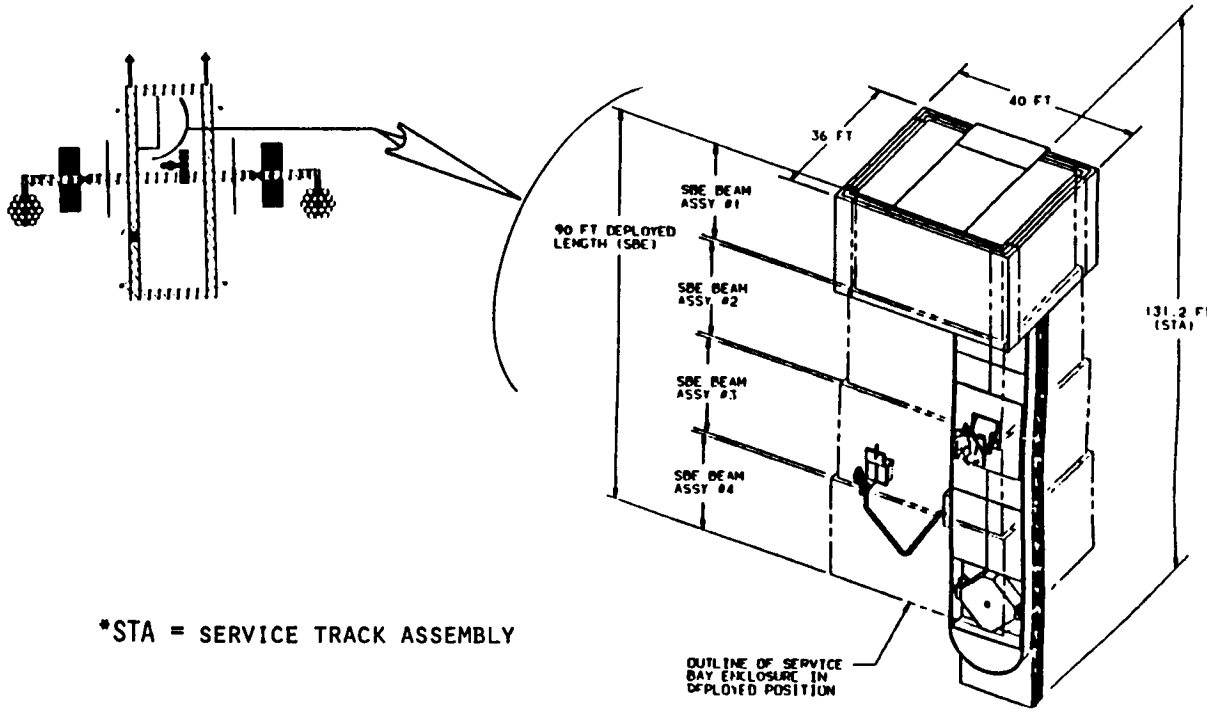
CUSTOMER SERVICING FACILITY

--CONCEPT FOR PACKAGING IN ORBITER CARGO BAY--



CUSTOMER SERVICING FACILITY

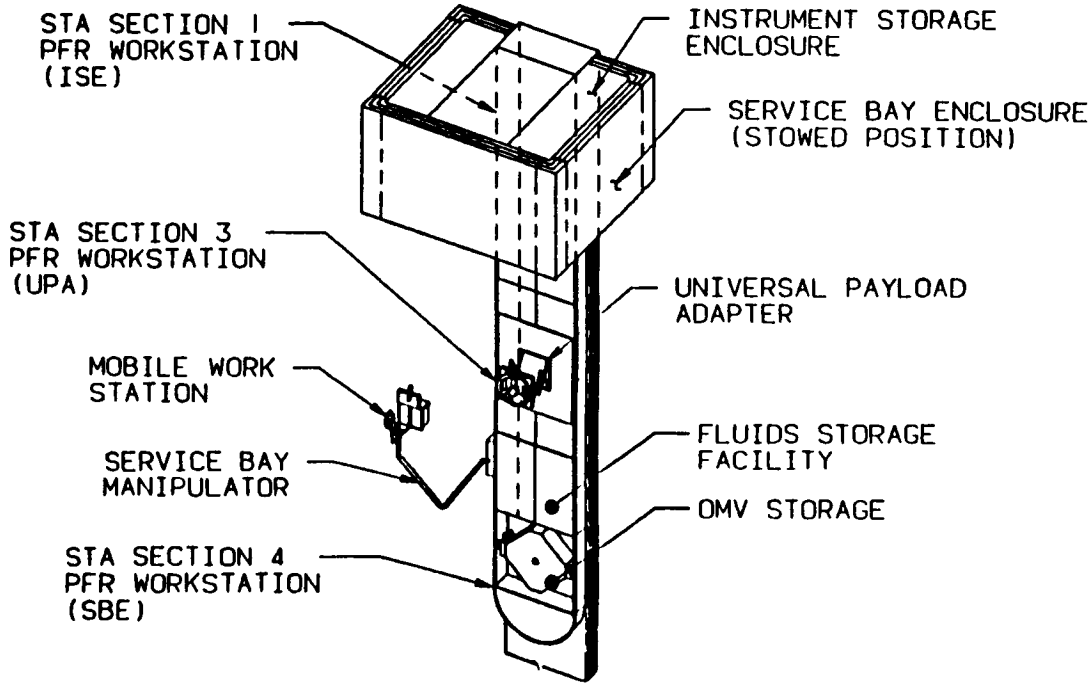
--SERVICE BAY ENCLOSURE (SBE)--



*STA = SERVICE TRACK ASSEMBLY

CUSTOMER SERVICING FACILITY

--SERVICE TRACK ASSEMBLY--



MOBILE SERVICING CENTRE SYSTEM

-- CANADIAN --

DEFINITION:

A ROBUST TELEROBOTIC SERVICER OPERATING IN THE SPACE ENVIRONMENT ON THE TRUSS STRUCTURE OF THE MANNED CORE SPACE STATION.

PROVIDES:

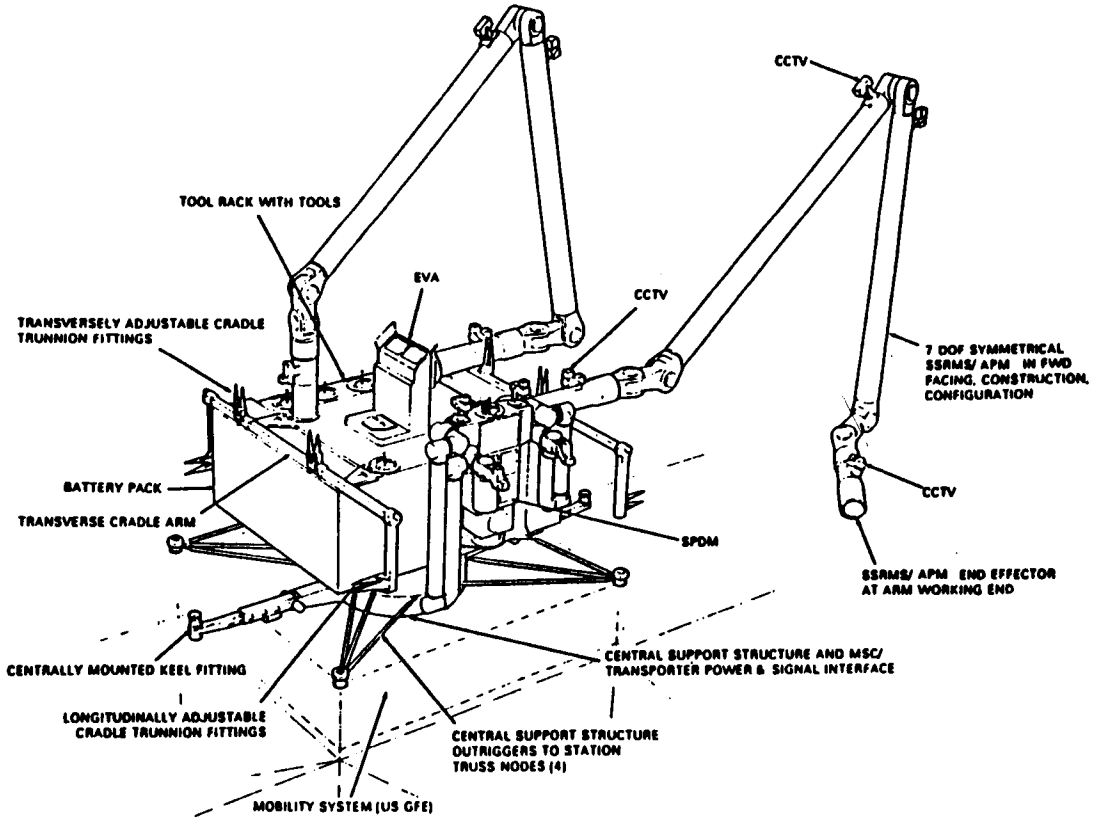
OPERATION ON BATTERIES OR DIRECT ELECTRICAL POWER SUPPLY
MANIPULATOR ARM(S)
ACCOMODATION FOR EVA
CONTROL FROM MANY LOCATIONS

CAPABILITIES:

ACCESS INTO SHUTTLE CARGO BAY
TRANSPORTATION
GRAPPLE A FREEFLYER
ASSEMBLY OPERATIONS
REPLACE ATTACHED PAYLOADS

MOBILE SERVICING CENTRE SYSTEM

--CANADIAN--



ROBOTICS

-- USA --

DEFINITION:

FLIGHT TELEROBOTICS CAPABILITY WITH DEXTROUS MANIPULATOR ARMS AVAILABLE TO SUPPORT INITIAL SPACE STATION ASSEMBLY AND TO SERVE AS THE SMART FRONT END FOR THE ORBITAL MANEUVERING VEHICLE (OMV).

STATUS:

PLANNING UNDERWAY.
INITIAL FUNDING PROVIDED.

POTENTIAL CAPABILITIES:

MULTIPLE ARMS
FORCE AND TORQUE FEEDBACK
LIGHTING AND TV VIEWING.